

The opinion in support of the decision being
entered today is not binding precedent of the Board.

Paper 81 **33**

By: Trial Section Merits Panel
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Filed:
27 September 2004

UNITED STATES PATENT AND TRADEMARK OFFICE

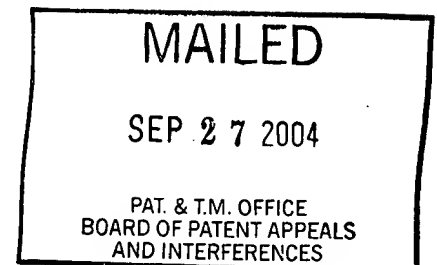
BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

PECHINEY EMBALLAGE FLEXIBLE EUROPE

Junior Party,
U.S. Patent 6,437,064

v.

CRYOVAC, INC.
Senior Party,
Application 08/996,367
Application 09/583,654



Patent Interference No. 105,092

Before: McKELVEY, Senior Administrative Patent Judge, and SCHAFER and
SPIEGEL, Administrative Patent Judges.

SPIEGEL, Administrative Patent Judge.

ORDER -- RULE 121(f)

I. Introduction

We recognize that Pechiney has filed a request for entry of an adverse judgment

(see "PECHINEY REQUEST FOR ADVERSE JUDGMENT," Paper 76 filed 12 August 2004). Action on the request is deferred pending resolution of the patentability issues raised herein.

Pursuant to 37 CFR § 41.121(f), within three (3) months from the issuance of this order the parties may present their view, including any argument and any supporting evidence, as to why Cryovac's involved claims are not unpatentable for the reasons set forth below.

II. List of Abbreviations

Definitions of abbreviations used in this opinion follow below.

- | | |
|-------------|--|
| CD | compositional distribution: the distribution of comonomer (number of branches) over polymer chains of different lengths. A narrow CD is one where the comonomer is uniformly distributed across all the polymer chains regardless of the chain length, whereas a broad CD is one where the amount of comonomer is a strong function of chain length. [Ex 3005, p. 289, c. 2.] |
| CGCT | constrained geometry catalyst technology: a single-site catalyst system for preparing ethylene/alpha-olefin copolymers developed by Dow Chemical Company which uses cyclopentadienylsilane complexed to an adjacent covalent moiety and held in association with the cyclopentadienyl moiety. [Ex 3003, p. 20, c. 3; Ex 3009, pp. 2-11; Ex 3010, c. 6, l. 29 - c. 13, l. 50.] |
| d | density: weight per unit volume of a substance, expressed in g/cm ³ or g/cc. Density depends on the extent of short-chain branching in polymer chains and, to a lesser degree, on molecular weight. [Ex 3015, pp. 705 and 724.] |
| EIPE | elastic polyethylene: a copolymer of ethylene and an alpha-olefin other than ethylene produced using a constrained geometry addition polymerization catalyst, i.e., with CGCT, which is less Newtonian and has a higher elastic modulus, particularly at high melt indices, compared to a linear copolymer of ethylene and a similar alpha-olefin content prepared using a multi-site catalyst, e.g., a Ziegler-Natta catalyst. [Ex 3009, p. 11.] |

| | |
|-------------------------------------|--|
| EPC | ethylene propylene copolymer: a copolymer of ethylene and propylene monomers wherein the propylene monomers are present as the major constituent. [Ex 3001, c. 4, ll. 6-11.] |
| EVA | ethylene vinyl acetate copolymer: a copolymer of ethylene and vinyl acetate monomers wherein the ethylene monomers are present as the major constituent. [Ex 3011, c. 4, ll. 1-5; Ex 3012, c. 1, ll. 36-37.] |
| FDA | Food and Drug Administration |
| HDPE | high density polyethylene: includes both homopolymers of ethylene and its copolymers with small amounts of alpha-olefins, with a density of 0.940 g/cm ³ or higher and molecular weights ranging from several hundreds for polyethylene (PE) to several millions for ultrahigh molecular weight polyethylene (UHMWPE). [Ex 3012, c. 5, ll. 43-45; Ex 3015, p. 724.] |
| I₂ | see melt index (MI). |
| I₁₀/I₂ | ratio of two MI values measured at 10 and 2.16 kg loads, which approximately correlates with molecular weight distribution (MWD) (see melt flow rate (MFR)). [Ex 3015, p. 705.] |
| L+T | percent dimensional change in a 10 x 10 cm specimen of film in both the longitudinal or machine direction (LD) and the cross or transverse direction (TD). [Ex 3008, p. 9, ll. 19-20 and p. 12, l. 15.] |
| LDPE | low density polyethylene or high pressure polyethylene: an ethylene homopolymer having a density from 0.910 to 0.925 g/cm ³ which is produced in high pressure processes, ranging from 800-2725 atmospheres (82-276 MPa), with molecular weight ranges from about 500 to about 60,000. LDPE have both long and short chain branching and display non-Newtonian flow behavior. [Ex 3011, c. 3, ll. 54-56; Ex 3012, c. 5 ll. 39-41; Ex 3015, pp. 704 and 707-708.] |
| LLDPE | linear low density polyethylene: a copolymer of ethylene and 8% or less of butene, octene or hexene having a density of 0.910-0.925 g/cm ³ and in which the molecules comprise long chains with few or no branches or cross-linked structures. [Ex 3011, c. 3, ll. 57-62; Ex 3012, c. 5, ll. 52-62; Ex 3015, p. 704.] |

| | |
|----------------------|---|
| LMDPE | linear medium density polyethylene: a copolymer of ethylene and less than 8% butene, octene or hexane having a density of 0.926-0.940 g/cm ³ and in which the molecules comprise long chains with few or no branches or cross-linked structures. [Ex 3011, c. 3, ll. 63-68.] |
| M_w | a polymer's average molecular weight, often described by the polymer's melt index (MI). [Ex 3009, c. 1, ll. 14-17.] |
| M_n | number of average molecular weights. [Ex 3009, c. 1, ll. 14-17.] |
| MD | a film's longitudinal or machine direction. [Ex 3011, c. 1, ll. 64-66.] |
| MDPE | medium density polyethylene: polyethylene having a density ranging from 0.926-0.940 g/cm ³ . [Ex 3012, c. 5, ll. 41-43; Ex 3015, p. 704.] |
| MFR | melt flow ratio or I_{21}/I_2 : ratio of two MI values measured at 21.6 and 2.16 kg loads. MFR is an approximate measure of the width of MWD for LLDPE. I_{10}/I_2 is an alternative ratio used for approximating MWD. [Ex 3015, p. 705.] |
| MI | melt index or I_2 : weight of molten resin flowing at 190°C for ten minutes through a 2.095 mm diameter die at a 2.16 kg load. MI is an approximate measure of the average molecular weight (M_w) of a polymer. [Ex 3015, pp. 705, 709 and 724.] |
| MR | megarad: 1×10^6 rads, where a rad is the quantity of ionizing radiation that results in the absorption of 100 ergs of energy per gram of irradiated material regardless of the source of the radiation. [Ex 3001, c. 7, l. 67 - c. 8, l. 3.] |
| MWD | molecular weight distribution or polydispersity: ratio of the weight-average and the number average molecular weights, M_w/M_n . MWD gives a general picture of the range of long, medium and short molecular chains in a polymer and can be measured directly, e.g., by gel permeation chromatography, or more routinely, by measuring I_{10}/I_2 . [Ex 3009, c. 1, ll. 13-22; Ex 3015, pp. 709 and 724.] |
| PE | polyethylene: a generic name for a large family of semicrystalline linear polymers with ethylene as the main building block produced in radical polymerization reactions at high pressures or in catalytic polymerization reactions. [Ex 3012, c. 5, ll. 33-35; Ex 3015, p. |

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- PP** **polypropylene:** a homopolymer of propylene having a density of approximately 0.90 g/cm³. [Ex 3011, c. 4, ll. 12-15.]
- PVDC** **polyvinylidene chloride copolymer** [Ex 312, c. 7, ll. 31-32; Ex 3013, c. 3, ll. 25-28.]
- SPO '92** International Business Forum on Special Polyolefins, SPO, held in Houston, Texas in 1992 and sponsored by Schotland Business Research. [Ex 3014.]
- TD** a film's cross or transverse direction. [Ex 3011, c. 1, ll. 64-66.]
- UHMWPE** **ultrahigh molecular weight polyethylene:** a completely nonbranched linear ethylene homopolymer having a density ranging from 0.930-0.935 g/cm³ and a molecular weight over 3x10⁶. [Ex 3015, pp. 704 and 724.]
- VLDPE** **very low density polyethylene:** polyethylene having a density ranging from 0.915-0.880 or lower g/cm³. [Ex 3012, c. 2, ll. 39-45; c. 4, ll. 49-50; c. 5, ll. 63-65; Ex 3015, pp. 704 and 708.]

III. Background¹

According to Kirk-Othmer 1980 (Ex 3001),²

[a] film ... is a flat section of a thermoplastic resin or a regenerated cellulosic material which is very thin in relation to its length and breadth and has a nominal thickness not greater than 0.25 mm ... (p. 216, ¶ 1).

Heat shrinkability arises from an elastic memory imparted to some thermoplastic films during their manufacture by either stretch orientation or by cross-linking induced through irradiation. Shrinkage takes place when heat is applied to the film, and it tends to revert to its original, unoriented state. It is important for such applications as taut, contoured-fit overwraps or sleeves. [¶ spanning pp. 217-227.]

¹ This "Background" is meant only as a brief historical overview and not as a comprehensive discussion.

² Kirk-Othmer ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY, third edition, Volume 10, pp. 216-245, published by John Wiley & Sons, New York (1980) (Kirk-Othmer 1980) (copy enclosed) (Ex 3001).

Conventional film-forming materials include acrylonitrile-butadiene-styrene (ABS), acrylic polymers, cellophane, cellulose, fluoroplastics, ionomer resins, polyamide (nylon), polybutylene, polycarbonate, polyester, polyethylene, polyimide, polypropylene, polystyrene, sulfone polymers, vinyls, polyurethane, water-soluble films and plastic paper (*id.*, ppl. 227-232). By 1980 cheaper biaxially oriented polypropylene film was replacing cellophane as a packaging film (*id.*, p. 228, ¶ 8).

Polyethylene, the largest volume film material, is available in a multitude of homopolymer and copolymer grades modified by additives. There are four general classifications: low density (LDPE), medium density (MDPE), high density (HDPE), and ultra-high molecular weight (UHMWPE). Mechanical, chemical and barrier properties of film and sheet generally improve with higher density, the exception being tear strength and impact strength. All of these properties improve with increase in molecular weight (decrease in melt index). The advantages of LDPE over other thermoplastics include cost, transparency, tear resistance, impact strength, and moisture and chemical resistance. It can readily be processed by all thermoplastic methods, including orientation for shrink-film applications. Among its disadvantages are poor grease resistance, high permeability to odors and gases, poor weatherability, flammability, and poor resistance to high temperature. [*id.*, ¶ bridging pp. 229-230.]

According to Modern Plastics International (Ex 3002),³ linear low density polyethylene (LLDPE) shrink films began rapidly displacing LDPE shrink films in the early 1980s (p. 42, c. 2, ¶ 4). Commercially available LLDPE blow film grades range in density from 0.916 to 0.938 g/cm³ with melt indices from 0.7 to 2.6 g/10 min, e.g., Dow's Dowlax® 2045 resin which has a density of 0.920, a melt index of 1.0 and is said to have exceptional tear strength (p. 42, c. 3, ¶ 4 - p. 43, c. 1, ¶ 1; p. 44, c. 1, table). Similar cast film grades have densities equal to or lower than blown film grades and

³ Modern Plastics International, January 1985, pp. 42-45 (copy enclosed) (Ex 3002).

melt indices ranging from 2.3 to 7.0, e.g., Dow's Dowlex® 2047 resin combines a density of 0.917 with a melt index of 2.3 (p. 43, c. 1, ¶ 3). (See also, Martino (Ex 3003)⁴ at p. 21, c. 1, ¶ 3, "the last big PE change, beginning around 1980. ... [was] the shift ... from branched LDPE, a homopolymer made in high-pressure reactors, to low-density copolymers consisting of linear ethylene backbones (hence, 'LLDPE') with short side chains of other alpha-olefin monomers like butene, hexene, and octene.")

By 1991, most linear ethylene polymers were made using some type of Ziegler-Natta multi-site catalyst. Then a new family of linear PEs was spawned using single-site catalyst systems. Use of single-site catalysts in place of the multi-site catalysts conventionally used to make linear PEs and polypropylene allowed for far more precise molecular control. Multi-site catalysts, such as a Ziegler-Natta catalyst, produce resins with broad molecular weight and composition distributions ("MWD" and "CD") because each site produces a different molecular species of polymer of varied chain length, including very long (high molecular weight) and very short (low molecular weight) tails, and because levels of comonomer (and therefore chain branching) is unevenly distributed between the chains. A single-site catalyst, however, contains only one active site and, therefore, produces only one type of polymer with very narrow MWD and CD. In addition, single-site catalysts are said to be versatile enough to synthesize all major alpha olefin monomers, including propylene, butene, hexane and octene.

⁴ Martino, R., "PLASTISCOPE: New polyolefin resins emerge: 'Branched linear' copolymers," Modern Plastics, pp. 20-22 and 25, November 1992 (copy enclosed) (Ex 3003).

[See e.g., Modern Plastics, July 1991 (Ex 3004)⁵ and Van der Sanden (Ex 3005)⁶.]

According to Van der Sanden (Ex 3005, p. 290, c. 1, ¶ 4 - c. 2, ¶ 2),

[t]he very uniform, narrow CD of these new ethylene polymers generates interesting property shifts when compared to conventional linear polyethylenes. The narrow CD means almost no highly branched MW polymer is present. Thus these narrow CD polymers have very low hexane extractables. The absence of high MW homopolymer fraction means that the clarity of these new ethylene polymers is superior to conventional materials. The narrow CD leads to a narrow melting point range and a lower peak melting point than a "standard" linear polyethylene with a similar melt index and density. These key changes in the melting characteristics translate into a much lower seal initiation temperature than conventional linear polyolefins with higher toughness and strength than high pressure LDPE or EVA's. ...

Narrow MWD/CD products are only a small facet of this new [single-site catalyst] technology. It is well known that narrow MWD polymers are somewhat more difficult to melt process due to their higher melt viscosities and lower melt strength. But since this new technology permits independent adjustment of MWD and CD, the MWD can be broadened to improve processability if desired while maintaining a narrow CD and its associated property advantages. Molecular tailoring has also been found to produce synergistic property effects such as improved toughness and improved processability. With conventional technology, one must normally sacrifice toughness to improve processing.

In November 1992, Martino reported that Exxon's PE resin line, sold under the trademark Exact®, was based on single-site catalyst technology and that Exxon was "[n]ow in development or in early use for making not only PE but also propylene and polystyrene" via single-site catalysts (Ex 3003, p. 20, ¶ 2). Martino further reported that Dow "claims to have taken single-site a step further" with its constrained geometry

⁵ "NPE Report: Exxon Cites 'Breakthrough' in Olefins Polymerization," Modern Plastics, pp. 61-62, July 1991 (copy enclosed) (Ex 3004).

⁶ Van der Sanden et al, (Van der Sanden), "A New Family of Linear Ethylene Polymers With Enhanced Sealing Performance," Polymers, Laminations & Coatings Conference, (San Diego) Proc. (Book 1): pp. 289-296 (TAPPI; September 3-6, 1991) (copy enclosed) (Ex 3005).

catalyst technology (CGCT), which is said to provide improvements over the physical properties of LLDPE while obtaining processability properties similar to those of conventional LLDPE (*id.*, p. 20, c. 3, ¶ 2 and p. 21, ¶ bridging cc. 1-2).

Senior party's earliest priority benefit application is filed 13 November 1992.

IV. Findings of fact (FF)

The following findings of fact are supported by a preponderance of the evidence.

1. The junior party is John P. Eckstein, Johnny Q. Zheng, Mark E. Nordness, Keith D. Lind, George H. Walburn, Mary E. Shepard, Gregory K. Jones and Gregory J. Seeke (**Pechiney**).
2. Pechiney is involved in the interference on the basis of U.S. Patent 6,437,064 ("Pechiney '064," Ex 3006), issued 20 August 2002, based on application 09/006,700, filed 14 January 1998.
3. Pechiney '064 (Ex 3006) has been accorded benefit for the purpose of priority of (a) application 08/481,617, filed 7 June 1995 and (b) application 08/082,227, filed 24 June 1993.
4. Pechiney's real party-in-interest is PECHINEY EMBALLAGE FLEXIBLE EUROPE.
5. The senior party is (a) Kelly R. Ahlgren, Robert Babrowicz, Solomon Bekele, Blaine C. Childress, Marvin R. Havens, Vincent W. Herran, Ronald D. Moffitt, Gautum P. Shah and George D. Wofford; and, (b) Kelly R. Ahlgren, Robert Babrowicz, Solomon Bekele, Blaine C. Childress, Marvin R. Havens, Ronald D. Moffit, Gautum P. Shah and George Wofford (collectively, **Cryovac**).

6. Cryovac is involved in the interference on the basis of (a) application 08/996,367 ("Cryovac '367," Ex 3007), filed 22 December 1997 and (b) application 09/583,654 ("Cryovac '654," Ex 3008), filed 30 May 2000.
7. Cryovac '367 (Ex 3007) has been accorded benefit for the purpose of priority of (i) application 08/747,241, filed 12 October 1996, (ii) application 08/418,926, filed 7 April 1995 and (iii) application 07/976,122, filed 13 November 1992.
8. Cryovac '654 (Ex 3008) has been accorded benefit for the purpose of priority of (i) application 08/962,825,⁷ filed 3 November 1997, (ii) application 08/018,657, filed 17 February 1993, (iii) application 07/983,017, filed 30 November 1992 and (iv) application 07/976,122, filed 13 November 1992.
9. Cryovac's real party-in-interest is CRYOVAC, INC.

[Paper 1, pp. 1-5; Paper 26, p. 2.]

10. The subject matter of the interference is defined by a single count, Count 1, i.e., "A heat shrink film according to claim 7 of U.S. Patent 6,347,064" (Paper 1, p. 6).
11. Pechiney claim 7 recites a heat shrink film comprising at least two layers wherein a first layer comprises a copolymer of ethylene and a C₃-C₂₀ alpha olefin formed by a polymerization reaction using a single-site catalyst.⁸

⁷ According to the "NOTICE DECLARING INTERFERENCE," dated 30 July 2003, "while not mentioned in Paper No. 1, Cryovac is accorded priority benefit of its earlier filed U.S. Application No. 09/962,825, filed November 13, 1997, now abandoned" (Paper 26, p. 2). Reference to application "09/962,825" is an inadvertent typographical error. U.S. application 08/962,825 is intended.

⁸ Pechiney '064 claim 7 reads:

7. The heat shrink film of claim 6
[6. The heat shrink film of claim 2
[2. The heat shrink film of claim 1
[1. A heat shrink film comprising at least two layers wherein a

12. The claims of the parties are:

| | |
|--------------|------------------------------------|
| Pechiney | 1-39 |
| Cryovac '367 | 1-8, 10-24, 26-43, 46-56 and 61-64 |
| Cryovac '654 | 1, 3-5 and 7-26 |

13. The claims of the parties which correspond to Count 1 are:

| | |
|--------------|------------------------------------|
| Pechiney | 1-3, 6-19 and 22-39 |
| Cryovac '367 | 1-8, 10-24, 26-43, 46-56 and 61-63 |
| Cryovac '654 | 1, 3-5, 7, 10-14 and 20-26 |

14. The claims of the parties which do not correspond to Count 1, and therefore are not involved in the interference, are:

| | |
|--------------|-----------------|
| Pechiney | 4, 5, 20 and 21 |
| Cryovac '367 | 64 |
| Cryovac '654 | 8, 9 and 15-19 |

[Paper 26, p. 2.]

Other findings of fact follow below.

V. Cryovac's involved claims

A. The subject matter of Cryovac '654's involved claims

15. Cryovac '654 claims 1, 24 and 25, all of the independent claims of application 09/583,654, are illustrative of Cryovac '654's claimed subject matter.

16. Cryovac '654 claim 1 reads:

A film suitable for packaging comprising a homogeneous single site catalyzed copolymer of ethylene and an alpha-olefin having from three to ten carbon atoms, said single site catalyzed copolymer having long chain branching, wherein said film is a multilayer film and is heat shrinkable.

first layer comprises a polymer formed by the polymerization
reaction with a single site catalyst]
wherein said first layer comprises an ethylene polymer formed by the polymerization
reaction with a single site catalyst]
wherein said polymer is a copolymer of ethylene and a C₃-C₂₀ alpha olefin.

17. Cryovac '654 claim 24 reads:

A tubing comprising a heat-shrinkable multilayer film suitable for packaging, wherein the film comprises a homogeneous single site catalyzed copolymer of ethylene and an alpha-olefin having from three to then [sic, ten] carbon atoms, the single site catalyzed copolymer having long chain branching.

18. Cryovac '654 claim 25 reads:

A process for making a heat-shrinkable film, comprising:
(A) extruding a film comprising a homogeneous single site catalyzed copolymer of ethylene and an alpha-olefin having from three to then [sic, ten] carbons, the single site catalyzed copolymer having long chain branching; and
B) cooling the film to the solid state with water;
C) reheating the film to a softening temperature of the homogeneous single site catalyzed copolymer having long chain branching;
D) stretching the film so that an oriented molecular configuration is produced; and
E) quenching the film which substantially retaining its stretched dimensions to set the film in the oriented molecular configuration.

19. The alpha-olefin may be a C₄₋₈ alpha-olefin (claim 3).

20. The single site catalyzed copolymer may be blended with another thermoplastic homopolymer or copolymer (claim 4) and have a density from about 0.86 g/cc to about 0.95 g/cc (claim 5), more specifically, from about 0.895 to 0.915 g/cc (claim 7).

21. The single site catalyst may be a metallocene catalyst (claim 10).

22. The film may comprise a barrier layer containing
(a) a vinylidene chloride and vinyl chloride copolymer,
(b) a vinylidene chloride and methyl acrylate copolymer,
(c) an ethylene and ethyl acrylate copolymer,
(d) a vinylidene chloride and acrylonitrile copolymer, or

- (e) an ethylene and vinyl alcohol copolymer (claim 11).
23. At least one layer of the film may be irradiated (claim 12), e.g., to a level up to about 12 MR (claim 13), more specifically from about 2 to 9 MR (claim 14).
24. The film may be oriented at a softening temperature of the single site catalyzed copolymer (claim 20), e.g., at a temperature of from 70°C to 100°C (claim 21), more specifically, from 80°C to 100°C (claim 22).
25. The orientation may be carried out using a tenter frame (claim 26).
26. The film may have an L+T free shrink of at least 67% (claim 23).
27. According to Cryovac '654 (p. 7, ll. 13-23),

The film of the present invention is preferably oriented and is formed by extrusion processes especially art-known coextrusion methods. It is initially cooled to a solid state by, for example, cascading water or chilled air quenching, after which it is reheated to within its orientation temperature range and oriented by stretching. The stretching to orient may be accomplished in many ways such as, for example, by "blown bubble" techniques or "tenter framing." These processes are well known to those skilled in the art and refer to orientation procedures whereby the material is heated to its softening temperature and then stretched in the cross or transverse direction (TD) and/or in the longitudinal or machine direction (MD). After being heated and stretched, the film is quickly quenched while substantially retaining its stretched dimensions to cool the film rapidly and thus set or lock in the oriented molecular configuration.

B. Cryovac '654 claims 1, 3-5, 7, 10-14 and 20-26 are unpatentable under 35 U.S.C. § 112, second paragraph

28. All of the involved Cryovac '654 claims require use of a single-site catalyzed copolymer having "long chain branching."
29. Cryovac '654 (Ex 3008) does not define the nature or amount of "long chain branching."
30. Rather, Cryovac '654 expressly references Dow EP 416 815 ("Dow," Ex 3009),

stating that "[i]t is believed that the Dow metallocene resins possess the **limited** long chain branching" recited in Cryovac '654's original claims (Ex 3008, p. 6, ¶¶ 2 and 3; p. 19, original claim 1).

31. Dow (Ex 3009) was published 13 March 1991 and, therefore, is prior art vis-a-vis Cryovac under 35 U.S.C. § 102(b).
32. Dow (Ex 3009) describes constrained geometry catalysts (i.e., single-site metallocene catalysts, p. 2, ll. 11-16 and p. 2, l. 43 - p. 5, l. 45) and preparation of addition polymers, especially copolymers of olefins, diolefins, hindered aliphatic vinyl monomers, vinylidene aromatic monomers, more especially copolymers of ethylene and C₃₋₁₀ alpha-olefins, preferably propylene, 1-butene, isobutylene, 4-methyl-1-pentene, 1-hexene and 1-octene (p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4).
33. Cryovac '654 Examples 1, 11-16 and 29-58 characterize the various Dow XUR-1567-48562-xx resins used (wherein xx is B9, B4, 6C, 6D and 6E) as homogenous ethylene octene copolymers "with limited long chain branching" (Ex 3008, p. 11, ll. 13-15; p. 13, ll. 9-13; and p. 15, ll. 8-15).
34. U.S. Patent 5,272,236 ("Lai," Ex 3010) issued 21 December 1993, based on application 07/776,130, filed 15 October 1991 and, therefore, is prior art vis-a-vis Cryovac under 35 U.S.C. § 102(e).
35. Lai is assigned to Dow Chemical Company and describes resins produced using metallocene constrained geometry catalysts as having limited long chain branching, i.e., the polymer backbone is substituted with up to 3 long chain

branches/1000 carbons (Ex 3010, c. 3, ll. 48-50).

36. Lai defines "long chain branching" as "a chain length of at least about 6 carbons, ... [and] can be as long as about the same length of the polymer backbone" (id., c. 3, ll. 58-63).

Therefore, we give a polymer having "long chain branching" its "broadest reasonable interpretation" and, accordingly, construe a polymer having "long chain branching" to encompass a polymer having any amount of long chain branching, wherein a long chain branch has a chain length of at least about 6 carbons. In re Hyatt, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1668 (Fed. Cir. 2000). This interpretation is not inconsistent with either Cryovac '654's disclosure or relevant prior art, i.e., Dow and Lai, as discussed above.

However, one of ordinary skill in the art would have reasonably expected side chain branches of single-site catalyzed ethylene/C₃₋₇ alpha olefin copolymers to have uniform side chain branches of one to five carbons in length, respectively, because the structure of the branches is determined by the type of olefin used in the polymerization reaction. Thus, Cryovac '654 claims 1, 3-5, 7, 10-14 and 20-26 are unclear in reciting films comprising single-site catalyzed ethylene/C₃₋₇ alpha olefin copolymers because these copolymers apparently would not have any long chain branching, i.e., side chains at least about 6 carbons in length. Alternatively, to the extent Cryovac '654 claims 1, 3-5, 7, 10-14 and 20-26 intend to recite use of single-site catalyzed ethylene/C₃₋₁₀ alpha olefin copolymers having some undefined, nonuniform side chain branching in addition to the uniform one to eight carbon long side chains expected from use of a C₃₋₁₀ alpha

olefin, the claims do not particularly point out and distinctly claim this subject matter.

Therefore, for the above reasons, Cryovac '654 claims 1, 3-5, 7, 10-14 and 20-26 are unpatentable under 35 U.S.C. § 112, second paragraph.

C. Cryovac '654's involved claims are unpatentable over the prior art

1. Cryovac '654 claims 1, 3-5, 7, 10, 12-14 and 20-26 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189), (2) Lai (US 5,272,236) and (3) Dow (EP 416 815)

37. U.S. Patent 4,532,189 (Ex 3011) issued to Mueller on 30 July 1985 and, therefore, is prior art vis-a-vis Cryovac under 35 U.S.C. § 102(b).
38. Mueller describes a multilayer heat shrink film comprising LLDPE resins, i.e., copolymers of ethylene and 8% or less of butene, octene or hexene having a density of 0.910 to 0.925 g/cm³ with few or no branches or cross-linked structures, as a constituent of a core and/or intermediate layer, alone or blended with another thermoplastic polymer (Ex 3011, c. 1, ll. 8-13; c. 2, ll. 3-11 and 29-41; c. 3, ll. 57-63; c. 4, ll. 18-26, 35-36, 45-47; c. 5, ll. 2-23 and 41-47).
39. Mueller's film is said to be produced by art known methods, preferably by (i) coextruding the raw materials into a tubular or planar form; (ii) quenching to cool, e.g., by passing through a cold water bath; (iii) optionally cross-linking to increase the structural strength of the film or the force at which the material can be stretched before tearing apart, e.g., by irradiation in the range of 0.5 MR to 12.0 MR; (iv) reheating and orienting the film, e.g., by "blown bubble" techniques or "tenter framing;" and (v) quenching the film to lock-in the oriented molecular structure (id., c. 1, l. 16 - c. 2, l. 28; c. 2, ll. 39-41; c. 3, ll. 57-63; c. 4, ll. 18-26; c.

7, l. 16 - c. 9, l. 17; Examples I-III).

40. According to Mueller, the orientation temperature range for a given film varies with the different polymers and blends used to make the film, but typically ranges from above room temperature to below the melting point of the film (id., c. 1, ll. 28-33).
41. Table I (bridging cc. 10-11) is said to tabulate various physical characteristics of the three films described in Mueller's examples I-III, including MD/TD (i.e., L+T) free shrink percentages over 67 percent (c. 11, ll. 1-20).
42. Thus, the multilayer heat shrink film of Mueller differs from that claimed by Cryovac '654 (a) in using LLDPE copolymers instead of homogeneous single-site catalyzed copolymers having long chain branching, as required by all of Cryovac '654's claims, (b) in failing to recite a barrier comprising at least one of the specific materials required by Cryovac '654 claim 11 and (c) in failing to describe orientation softening temperatures as required by Cryovac '654 claims 21-22.
43. Lai, discussed above (FF 34-36), describes homogeneous single-site catalyzed substantially linear polymers, preferably ethylene/C₃₋₂₀ alpha olefin copolymers, said to have been prepared using constrained geometry catalyst technology (CGCT) and said to have long chain branching, i.e., the polymer backbone is substituted with up to 3 long chain branches/1000 carbons (FF 35 and 36; Ex 3010, c. 1, ll. 6-10; c. 2, ll. 22-36; c. 3, ll. 26-30 and 48-50; c. 6, l. 29 - c. 13, l. 50: c. 14, ll. 31-47).
44. Lai's polymers are said to show improved melt elasticity and processability in

thermal forming processes, e.g., making extrusion coated films, based on their properties, which include (a) densities ranging from about 0.85 to about 0.97 g/cc, (b) a melt flow ration (MFR), I_{10}/I_2 , ≥ 5.63 , preferably from about 7 to about 20, (c) a critical shear stress at onset of gross melt fracture of $> \sim 4 \times 10^6$ dynes/cm² and, (d) preferably, from about 0.01 to about 3 long chain branches/1000 carbons (Ex 3010, c. 2, ll. 25-50; c. 3, ll. 4-63; c. 14, ll. 10-11; c. 18, ll. 17-24 and 43-45; c. 14, ll. 8-11).

45. Moreover, according to Lai, the most unique characteristic of these polymers is that the MFR is essentially independent of the MWD, in contrast to conventional resins wherein when MWD increases, MFR also increases (Ex 3010, c. 5, ll. 1-7).
46. Further according to Lai, these polymers exhibit "non-susceptibility to melt fracture or the formation of extrudate defects during high pressure, high speed extrusion" in contrast to conventional LLDPEs, in short, processability similar to LDPE while possessing strength and other physical characteristics similar to LLDPE (Ex 3010, c. 5, ll 40-66).
47. Lai Table II is said to compare two of these polymers, both ethylene/1-octene copolymers (Examples 5 and 6) to conventional Ziegler polymerized resins (Examples 7-9). "Surprisingly, even though the molecular weight distribution of Examples 5 and 6 is narrow ..., the I_{10}/I_2 values are higher in comparison with the comparative examples 7-9" (Ex 3010, Table II, bridging cc. 19-20 and c. 19, ll. 20-23).

48. Furthermore, the Dow technology and resins cited by Cryovac '654 (FF 30) are the same constrained geometry catalyst technology and resins described by Lai (Ex 3009, abstract; p. 2, ll. 10-16 and 40-42; p. 5, ll. 46-51; p. 6, ll. 21-22; p. 11, ll. 32-41; p. 12, ll. 34-41 and p. 13, ll. 1-7). Dow also describes typical melting points for these resins as ranging from 50°C to 135°C (*id.*, p. 12, ll. 40-41).
49. Finally, according to both Lai and Dow, CGCT polymers may be blended with other thermoplastic polymers to provide blends having desirable properties (Ex 3010, c. 14, ll. 31-40; Ex 3009, p. 13, ll. 1-6).

It would have been obvious to one of ordinary skill in the art to modify the multilayer heat shrink film of Mueller by substituting Lai's elastic substantially linear olefin polymers, e.g., a preferred ethylene/1-octene copolymer, for the conventional LLDPEs used by Mueller. Use of Lai's elastic substantially linear olefin polymers would provide the processability of a conventional LDPE but with the strength and toughness of a conventional LLDPE. Moreover, insofar as both Cryovac '654 and Lai describe substantially similar resins, i.e., homogeneous ethylene/1-octene copolymers having long chain branching, overlapping densities and melt indices, and said to be produced using the same CGCT technology described by Dow, one of ordinary skill in the art would have had a reasonable basis to expect a Mueller/Lai/Dow film to have similar L+T free shrink percents and orientation temperatures, especially since Dow describes typical melting points for these resins as ranging from 50°C to 135°C.

2. Cryovac '654 claim 11 is unpatentable under 35 U.S.C. § 103(a) as obvious over (1) Mueller (US 4,532,189), (2) Lai (US 5,272,236), (3) Dow (EP 416 815) and either (4) Ferguson (US 4,640,856) or (5) Newsome (US 4,457,960)

50. U.S. Patent 4,640,857 (Ferguson) issued 3 February 1987 and, therefore, is prior art vis-a-vis Cryovac under 35 U.S.C. § 102(b).
51. Ferguson describes a multilayer heat shrink film useful for food packaging, comprising a conventional gas barrier layer of (1) copolymers of vinylidene chloride or (2) hydrolyzed ethylene-vinyl acetate copolymers, which prevents oxygen from passing through the film and oxidizing the food (Ex 3012, c. 1, ll. 43-44; c. 4, ll. 27-34 and 51-55; c. 8, ll. 48-57).
52. U.S. Patent 4,457,960 (Newsome) issued 3 July 1984 and, therefore, is prior art vis-a-vis Cryovac under 35 U.S.C. § 102(b).
53. Like Ferguson, Newsome describes conventional barrier layers, e.g., of polyvinyl chloride polyvinylidene chloride copolymer, to prevent oxygen from passing through a multilayer heat shrink film and spoiling food inside (Ex 3012, c. 1, ll. 43-44 and c. 4, ll. 48-57; Ex 3013, c. 1, ll. 36-40 and c. 3, ll. 25-28).

It would have been further obvious to one of ordinary skill in the art to modify the multilayer film of Mueller/Lai/Dow by providing a conventional barrier of vinylidene chloride copolymer or ethylene/vinyl alcohol copolymer as described by Ferguson or Newsome. Use of a conventional barrier layer would lower gas and moisture permeability (see Ex 3011, c. 4, ll. 37-40), thereby preventing the surrounding atmosphere from detrimentally affecting the packaged food, e.g., by oxidizing or spoiling the food, by changing its color, by reducing its visual appeal.

3. **Cryovac '654 claims 1, 3-5, 7, 10, 12-14 and 20-26 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189) and (2) Dow CGCT XUR-1567-48652-xx resin**

54. According to Cryovac, Cryovac approached Dow Chemical Company "expressing an interest in working with Dow to develop ethylene/octene single site resins for Cryovac packaging films" (Paper 78, p. 4).
55. Following execution of a confidentiality agreement, Dow Chemical Company is said to have supplied Cryovac with resins identified using a XUR-1567-48562-xx numbering system (Paper 78, p. 4; Exs 3016 and 3017).
56. According to Dow Chemical Company, CGCT resins XUR-1567-48562 -6C, -6D and -6E, sent to Cryovac for evaluation,

are more homogenous polymers in composition relative to the more traditional and heterogenous LLDPE and ULDPE polymers which you presently purchase from Dow. At the same polymer density, the CGCT products will have a lower crystallinity, a lower melting point and a more narrow range between the softening point and melting point. Benefits of the narrow comonomer distribution would include lower heat seal initiation temperatures and faster sealing speeds, improved film optics, and lower hexane extractables. The CGCT resins are also expected to orient better and subsequently shrink at lower temperatures. More balanced shrink properties are also anticipated of the CGCT resins. Based on these benefits, the new polymers would have improved performance and utility as sealant layers and as oriented shrink films fabricated in a conventional or double bubble process.

Surprisingly, these materials will process similarly to conventional LLDPE and LDPE polymers with similar energy requirements and similar or improved melt strength. The materials should also have excellent drawdown and perhaps improved resistance to draw resonance. [Ex 3017, p. 1.]

57. Dow Chemical Company is said to have provided the following data to guide Cryovac's choice of resin density relative to certain performance data, i.e.,

| Density | Melt Pt. | Vicat Soft. Pt |
|---------|----------|----------------|
| .885 | 74 | 58 |
| .895 | 88 | 74 |
| .905 | 99 | 90 |

.915

109

102

Materials below about .895 g/cc are not expected to comply with FDA regulations for direct food contact due to solubility in hexane, and therefore, high hexane extractables. Compliance with FDA regulations for direct food contact is anticipated down to about .910 g/cc for CGCT polymers pending the completion of Dow internal testing already in progress and compliance down to about .895 g/cc is anticipated pending successful petitioning with the FDA. ... [Ex 3018, p. 1.]

58. Dow Chemical Company also appears to have provided the following physical data on CGCT samples shipped to Cryovac (Ex 3018, p. 3):

| XUR-1567- | MI | I₁₀/I₂ | density | antioxidant |
|------------------|-----------|-------------------------------------|----------------|--------------------|
| 48562-6C | 1.0 | [not given] | 0.915 | low |
| 48562-6D | 1.0 | [not given] | 0.905 | low |
| 48562-6E | 1.0 | [not given] | 0.895 | low |
| 48562-18A | 1.1 | 10.3 | 0.9179 | high |
| 48562-21B | 1.0 | 10.4 | 0.9163 | low |
| 48562-21E | 1.0 | 8.5 | 0.902 | low |
| 48562-22A | 2.9 | 8.5 | 0.9196 | low |
| 48562-A3 | 2.0 | 8.6 | 0.8954 | low |
| 48562-A4 | 1.1 | 9.1 | 0.9004 | low |
| 48562-A5 | 0.9 | 9.6 | 0.9052 | low |
| 48562-A6 | 1.1 | 9.5 | 0.9104 | low |
| 48562-A7 | 2.0 | 9.2 | 0.9105 | low |
| 48562-B4 | 1.0 | 9.6 | 0.9090 | low |
| 48562-B5 | 1.9 | 9.1 | 0.9086 | low |
| 48562-B6 | 2.0 | 8.8 | 0.9081 | high |
| 48562-B7 | 2.0 | 9.8 | 0.9169 | low |
| 48562-B9 | 1.0 | 9.2 | 0.9041 | low |
| 48562-B10 | 1.0 | 9.1 | 0.9000 | high |

59. In addition, it appears that Dow Chemical Company provided "CGCT samples, ... slides and ... verbal comments about long chain branching, process conditions, etc." to Cryovac as "part of ... [their] secrecy agreement" (Ex 3019, p. 2, ¶ 1).
60. Moreover, insofar as Cryovac '654 describes the supplied CGCT resins as homogeneous ethylene octene copolymers "with limited long chain branching" (FF 33) and the Dow Chemical Company secrecy agreement prohibited Cryovac from determining the chemical identity of the supplied CGCT resins (Ex 3016, ¶ 4), it further appears that Dow Chemical Company indeed communicated to Cryovac that the supplied CGCT resins possessed "limited long chain branching."
61. Therefore, while there is no evidence that Dow Chemical Company described the CGCT XUR-1567-48652-xx resins supplied to Cryovac in any trade or other publicly available literature, there is evidence that Dow Chemical Company provided Cryovac with technical information and/or physical characteristics of these resins, albeit in private communications.

Oddzon Products, Inc. v. Just Toys, Inc., 122 F.3d 1396, 1401-02, 43 USPQ2d

1641, 1645 (Fed. Cir. 1997) held that 35 U.S.C. § 102(f) is a prior art provision for purposes of 35 U.S.C. § 103.

Section 102(f) provides that a person shall be entitled to a patent unless "he did not himself invent the subject matter sought to be patented." This is a derivation provision, which provides that one may not obtain a patent on that which is obtained from someone else whose possession of the subject matter is inherently "prior." It does not pertain only to public knowledge, but also applies to private communications between the inventor and another which may never become public." *Id.*

62. Citing Oddzon, Cryovac agrees that "[t]o the extent that information concerning the properties and potential uses of the experimental resins of Dow were [sic, was] communicated to the Cryovac inventors, then such communications could be considered prior art under § 102(f) since they were 'private communications between the inventor and another which may never become public'" (Paper 78, p. 6; Paper 79, p. 2).

Mueller describes a conventional multilayer heat shrink film comprising LLDPE, which film has been manufactured by well known methods, e.g., extrusion, as discussed above (FF 37-42).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the multilayer heat shrink film of Mueller by substituting a CGCT XUR-1567-48652-xx resin for the conventional LLDPEs used by Mueller. Insofar as the MWD of CGCT XUR-1567-48652-xx resins is independent of their MI, CGCT XUR-1567-48652-xx resins can be tailored (FF 56 and 58) to improve processability without sacrificing toughness through routine optimization of result effective variables, e.g., amount of comonomer used, to provide MWD and CD tailored for film extrusion. In other words, use of CGCT XUR-1567-48652-xx resins would provide lower heat seal initiation temperatures, faster sealing speeds, improved film optics, lower hexane extractables, better orientation, shrinkage at lower temperatures, etc. and also provide processability similar to LDPE.

4. **Cryovac '654 claim 11 is unpatentable under 35 U.S.C. § 103(a) as obvious over (1) Mueller (US 4,532,189), (2) Dow CGCT XUR-1567-48652-xx resins, and either (3) Ferguson (US 4,640,856) or (4) Newsome (US 4,457,960)**

Ferguson and Newsome describe use of conventional barrier layers comprising conventional vinylidene chloride copolymers or ethylene/vinyl alcohol copolymers in multilayer heat shrink films as discussed above (FF 50-53).

Analogous to § V.C.2 above, it would have been obvious to one of ordinary skill in the art to modify the multilayer film of Mueller/Dow CGCT XUR-1567-48652-xx resins by providing a conventional barrier of vinylidene chloride copolymer or ethylene/vinyl alcohol copolymer as described by Ferguson or Newsome. Use of a conventional barrier layer would lower gas and moisture permeability (see Ex 3011, c. 4, ll. 37-40), thereby preventing the surrounding atmosphere from detrimentally affecting the packaged food, e.g., by oxidizing or spoiling the food, by changing its color, by reducing its visual appeal.

D. The subject matter of Cryovac '367's involved claims

63. Cryovac '367 claims 1-8, 10-24, 26-42, 56 and 61-63 are directed to heat-shrinkable films comprising a homogeneous linear single site catalyzed copolymer of ethylene and a C₃₋₁₀ alpha olefin and a density of at least 0.902 g/cc, wherein the films are made by a specific process.
64. Cryovac '367 claim 1 is illustrative:

A heat shrinkable film comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to ten carbon atoms, said copolymer having a density of at least 0.902 g/cc, wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water, and thereafter heated to its softening temperature and stretched in its machine and transverse directions followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated.

65. The film can be a multilayer film, with the homogeneous linear copolymer present in one or more outer layers or in an inner layer (claims 16, 18, 35, 36 and 42).
66. Particularly claimed multilayer films include
- (a) a film having outer layer comprising propylene with an inner core layer comprising the homogeneous linear copolymer (claim 16),
 - (b) a film comprising a heat sealing layer, an inner layer comprising the homogeneous linear copolymer, and a barrier layer (claim 18),
 - (c) a film comprising a heat sealing layer and a barrier layer, wherein the heat sealing layer contains the homogeneous linear copolymer (claim 28),
 - (d) a film comprising at least two layers, wherein at least one layer contains the homogeneous linear copolymer and at least one layer is crosslinked (claim 35),
 - (e) a film comprising outer layers, each comprising the homogeneous linear copolymer, and an inner core layer therebetween (claim 36), and
 - (f) a seamless tubing comprising a multilayer film containing the homogeneous linear copolymer (claim 42).
67. The homogenous linear copolymer may comprise an ethylene/C₆₋₈ alpha olefin (claim 8), such as hexene (claim 10) or octene (claim 11).
68. The homogenous linear copolymer can be blended with a thermoplastic homopolymer or a thermoplastic copolymer (claim 2).

69. The thermoplastic copolymer can be a heterogeneous copolymer of ethylene and a C_{3-10} alpha olefin and have a density either below 0.90 g/cc or above 0.90 g/cc (claims 3-5) or a copolymer of ethylene and vinyl acetate, alkyl acrylate, carbon monoxide, butadiene, styrene, acrylic acid or a metal neutralized acrylate salt (claim 6).
70. The thermoplastic homopolymer can comprise an alpha olefin homopolymer (claim 7).
71. The propylene can be a copolymer ~100% to ~90% by weight propylene and ~0% to ~10% by weight ethylene (claim 17).
72. The barrier layer can comprise (a) a vinylidene chloride/methyl acrylate copolymer, (b) a vinylidene chloride/vinyl chloride copolymer, (c) an ethylene vinyl alcohol copolymer or (d) a nylon (claims 19- 22).
73. The heat sealing layer can comprise a heterogeneous ethylene/ C_{3-10} alpha olefin copolymer or a copolymer of ethylene and vinyl acetate, alkyl acrylate, acrylic acid or a metal neutralized acrylate salt (claims 23 and 24).
74. The multilayer film may further include an inner adhesive layer (claim 27).
75. Cryovac '367 claims 43 and 46-55 are process claims.
76. Cryovac '367 claim 43 reads:

A process for making a heat-shrinkable film, comprising:
(A) extruding a film comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to ten carbon atoms, said copolymer having a density of at least 0.902 g/cc; and
B) cooling the film to the solid state by cascading water;
C) reheating the film to a softening temperature of the homogeneous linear single site catalyzed copolymer;
D) stretching the film so that an oriented molecular configuration

is produced;

E) quenching the film while substantially retaining its stretched dimensions to set the film in the oriented molecular configuration.

77. The film can be reheated to softening by hot water (claim 46) and oriented at temperature from 83°C to 115°C (claim 50), from 87°C to 99°C (claim 51) or from 91°C to 99°C (claim 52).
78. The film can be oriented using either a trapped bubble or tenter frame technique (claims 47 and 48) in both its machine direction and its transverse direction (claim 49).
79. The film can be irradiated after cooling to the solid state (claim 53), e.g., after step E (claim 54).
80. The process can further comprising a step between steps B and C of extrusion coating the film with a layer comprising at least one of (a) vinylidene chloride/vinyl chloride copolymer, (b) vinylidene chloride/methyl acrylate copolymer, (c) vinylidene chloride ethyl acrylate copolymer and (d) vinylidene chloride/acrylonitrile copolymer (claim 55).
81. According to Cryovac '367 (p. 10, l. 22 - p. 11, l. 6),

[t]he film of the present invention is preferably oriented and is formed by extrusion processes especially art-known coextrusion methods. It is initially cooled to a solid stated by, for example, cascading water or chilled air quenching, after which it is reheated to within its orientation temperature range and oriented by stretching. The stretching to orient may be accomplished in many ways such as, for example, by "blown bubble" techniques or "tenter framing." These processes are well known to those skilled in the art and refer to orientation procedures whereby the material is heated to its softening temperature and then stretched in the cross or transverse direction (TD) and/or in the longitudinal or machine direction (MD). After being heated and stretched, the film is quickly quenched while substantially retaining its stretched dimensions to cool the

film rapidly and thus set or lock in the oriented molecular configuration.

E. Cryovac '367's involved claims are unpatentable over the prior art

- 1. Cryovac '367 claims 1-2, 7-8, 10-11, 16-17, 35-36, 42-43, 46-54, 56 and 61-63 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189), (2) Lai (US 5,272,236) and (3) Dow (EP 416 815)**

Mueller has been discussed above (FF 37-41) and describes multilayer heat shrink films comprising LLDPE resins, i.e., copolymers of ethylene and butene, octene or hexene, as a constituent of a core and/or intermediate layer, alone or blended with another thermoplastic resin (FF 38; Ex 3011, c. 1, ll. 8-13; c. 2, ll. 3-11, 39-41; c. 3, ll. 57-63; c. 4, ll. 18-46; c. 5, ll. 41-47; c. 5, l. 66 - c. 6, l. 2; c. 6, ll. 20-23, 36-43; c. 7, ll. 12-15). Mueller's films are said to be produced by art known methods, preferably, by (i) coextruding the raw materials into a tubular or planar form; (ii) quenching to cool, e.g., by passing through a water bath; (iii) optionally cross-linking to increase the structural strength of the film or the force at which the material can be stretched before tearing apart, e.g., by radiation in the range of 0.5 MR to 12.0 MR; (iv) reheating and orienting the film, e.g., by "blown bubble" techniques or "tenter framing," in both its machine and transverse directions; and (v) quenching the film to lock-in the oriented molecular structure (FF 39; Ex 3011, c. 1, ll. 16-17, 22-33, 56-68; c. 2, ll. 22-26; c. 4, ll. 18-26; c. 7, ll. 12-16, 35-37, 44-47, 55-56; c. 8, ll. 3-5, 16-35, 50-53, 60-61; c. 8, l. 67 - c. 9, l. 17). According to Mueller, the orientation temperature range varies with the different resins and blends used to make the films, but typically ranges from above room temperature to below the melting point of the film (FF 40; Ex 3011, c. 1, ll. 28-33).

82. Further according to Mueller, a particularly preferred film comprises a core layer

consisting essentially of LLDPE and two outer skin layers consisting essentially of a blend of polypropylene and an ethylene/propylene copolymer (Ex 3011, c. 4, ll. 6-11; c. 5, l. 66 - c. 6, l. 2).

83. Thus, the multilayer heat shrink film of Mueller differs from that claimed by Cryovac '367 in using LLDPE copolymers instead of homogeneous linear single site catalyzed ethylene/ C_{6-10} alpha olefin copolymers.

Lai has been discussed above (FF 34-36, 43-47, 49) and describes homogeneous single-site catalyzed substantially linear ethylene/ C_{3-20} alpha olefin copolymers, e.g., copolymers of ethylene and hexene or octene, said to show improved melt elasticity and processability in thermal forming processes, e.g., making extrusion coated films. According to Lai, the most unique characteristic of these polymers is that the MFR is essentially independent of the MWD, i.e., these polymers exhibit processability similar to LDPEs, while possessing strength and other physical characteristics similar to LLDPEs. [FF 43-47; Ex 3010, c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35, 40-42, 48-63; c. 4, ll. 10-11, c. 5, ll. 1-7, 40-43, 59-64; c. 18, ll. 17-24, 43-45; c. 19, ll. 20-23.]

Dow has been discussed above (FF 30-32, 48-49) and, like Lai, describes homogeneous single-site catalyzed copolymers, e.g., of ethylene and hexene or octene, prepared using CGCT, which copolymers are said to be less Newtonian and have a higher elastic modulus compared to a linear copolymer of ethylene and a similar alpha-olefin content prepared using a multi-site catalyst, e.g., a Ziegler-Natta catalyst (FF 48, Ex 3009: p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4; p. 11,

ll. 32-41 and p. 12, ll. 34-41).

According to both Lai and Dow, CGCT polymers, like Mueller's LLDPE polymers, may be blended with other thermoplastic plastics to provide blends having desirable properties (FF 49) (Ex 3011, c. 4, ll. 35-36, 45-47; c. 5, ll. 2-23, 46; Ex 3010, c. 14, ll. 31-40; Ex 3009, p. 13, ll. 1-6).

It would have been obvious to one of ordinary skill in the art to modify the multilayer heat shrink film of Mueller by substituting an EIPE, e.g., a preferred ethylene/1-octene copolymer, as described by Lai and Dow, for the conventional LLDPEs used by Mueller. Use of an EIPE as described by Lai and Dow would provide processability similar to that of a conventional LDPE but with strength and other physical characteristics similar to LLDPE.

2. Cryovac '367 claims 3-6, 23-24, 37, 39 and 41 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189), (2) Lai (US 5,272,236), (3) Dow (EP 416 815) and (4) Warren I (US 4,837,084)

84. The multilayer film of Mueller/Lai/Dow differs from the film of Cryovac '367 claims 2-7, 37, 39 and 41 in failing to recite blending an EIPE of Lai/Dow with a thermoplastic homopolymer or copolymer, e.g., a heterogeneous ethylene/C₃₋₁₀ alpha olefin or a copolymer of ethylene and vinyl acetate, alkyl acrylate, carbon monoxide, butadiene, styrene, acrylic acid or a metal neutralized salt of an acrylic acid.
85. U.S. Patent 4,837,084 (Warren I) issued 6 June 1989 and, therefore, is prior art vis-a-vis Cryovac under 35 U.S.C. § 102(b).
86. Warren I describes blending copolymers of ethylene and higher alpha olefins,

e.g., butene and octene, with LLDPE, LDPE, ethylene vinyl acetate, polypropylene and ethylene/C₁₋₈ alkyl acrylate to improve heat shrink and cold seal properties in multilayer heat shrink films (Ex 3022, c. 2, ll. 11-61).

87. Moreover, according to Dow, its described CGCT polymers may be blended with synthetic or natural polymers, especially, polyethylene, ethylene/ α -olefin copolymers, polypropylene, polystyrene, polycarbonate, polyamide and silicone, to provide blends having desirable properties (Ex 3009, p. 13, ll. 1-6).
88. Lai similarly describes preparing useful blends of its CGCT polymers with at least one other natural or synthetic polymer, preferably, polyethylene, ethylene/ α -olefin copolymers, polystyrene and conventional LLDPE and HDPE (Ex 3010, c. 14, ll. 31-40).

It would have been obvious to one of ordinary skill in the art to modify the multilayer heat shrink film of Mueller/Lai/Dow by blending the Lai/Dow CGCT EIPE with another conventional natural or synthetic polymer, e.g., a heterogeneous ethylene/higher alpha olefin copolymer or a copolymer of ethylene and vinyl acetate or alkyl acrylate. Use of such a blended EIPE would provide improved heat shrink and cold seal properties in the multilayer heat shrink film of Mueller/Lai/Dow.

- 3. Cryovac '367 claims 12-15, 18-34, 38, 40 and 55 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189), (2) Lai (US 5,272,236), (3) Dow (EP 416 815) and (4) Warren I (US 4,837,084), (5) Ferguson (US 4,640,856), (6) Newsome (US 4,457,960) and (7) Warren II (US 4,957,790)**

89. The multilayer heat shrink film of Mueller/Lai/Dow/Warren I differs from the film of Cryovac '367 claims 12-15, 18-34, 38 and 40 in failing to recite conventional

alternative layered structures useful in multilayer heat shrink film, including (i) conventional barrier layers comprising (a) copolymers of vinylidene chloride and methyl acrylate or vinyl chloride, (b) an ethylene vinyl alcohol copolymer or (c) nylon and (ii) conventional adhesive layers.

90. The process of producing the multilayer heat shrink film of Mueller/Lai/Dow differs from the film of Cryovac '367 claim 55 in failing to describe, between steps B and C, of extrusion coating the film with a vinylidene chloride copolymer. Ferguson (FF 50-51) and Newsome (FF 52-53) have been discussed above and describe multilayer heat shrink films, including conventional gas barrier and adhesive layers.

91. Newsome describes a number of conventional alternative layered structures useful in multilayer heat shrink films, including both symmetrical and asymmetrical arrangements of barrier layers, sealant layers, adhesive layers, transition layers, abuse layers, etc., having compositions and thicknesses selected according to the product the multilayer heat shrink film is used to provide, e.g., a food wrapping, a food storage bag, etc. (Ex 3013, c. 1, ll. 35-40; c. 3, ll. 25-28; c. 7, l. 56 - c. 8, l. 15).

Newsome also describes conventional barrier layers comprising a polyvinyl chloride polyvinylidene chloride copolymer or an ethylene vinyl alcohol copolymer for preventing oxygen from passing through the film and spoiling food wrapped inside (FF 53; Ex 3013, c. 1, ll. 35-39, 56-58; c. 3, ll. 25-28).

Ferguson describes conventional barrier layers comprising (1) copolymers of

vinylidene chloride or (2) hydrolyzed ethylene-vinyl acetate copolymers or (3) nylon (polyamide) which prevents oxygen from passing through the film and oxidizing food packaged inside the film (FF 51; Ex 3012, c. 1, ll. 43-44, c. 4, ll. 27-34, 48-57, 51-56; c. 8, ll. 48-57).

92. U.S. Patent 4,957,790 (Ex 3023, Warren II) issued 18 September 1990 and, therefore, is prior art vis-a-vis Cryovac under 35 U.S.C. § 102(b).

93. Warren II describes barrier layers comprising a copolymer of vinylidene chloride and methyl acrylate, a copolymer of vinylidene chloride and vinyl chloride, or an ethylene vinyl alcohol copolymer (Ex 3023, c. 8, ll. 1-7 and 24-39).

It would have been obvious to one of ordinary skill in the art to modify the multilayer film of Mueller/Lai/Dow and/or Warren I by providing conventional additional layers, e.g., barrier layers comprising conventional materials, e.g., a vinylidene chloride copolymer or an ethylene vinyl alcohol copolymer or nylon and adhesive layers comprising conventional materials, e.g., an ethylene vinyl alcohol copolymer. Use of a barrier layer would prevent atmospheric oxygen from reacting with packaged food and thereby spoiling the food and/or changing its color. Use of an adhesive layer would prevent delamination of the film's multilayered structure.

94. Ferguson further describes extrusion coating an irradiated first or substrate layer of a multilayer heat shrink film with a vinylidene chloride copolymer (Ex 3012, c. 6, ll. 29-37).

95. According to both Warren I (Ex 3022, c. 6, ll. 58-62) and Warren II (Ex 3023, c. 7, ll. 58-62), irradiation of a first or substrate layer of a multilayer heat shrink film

should take place before a vinylidene chloride copolymer barrier layer is applied because the irradiation will degrade the vinylidene chloride copolymer.

Thus, it would have been further obvious to one of ordinary skill in the art to extrusion coat a vinylidene chloride copolymer barrier layer between steps B and C of Cryovac '367 process claim 43. This would permit the first or substrate layer to be irradiated without degrading the barrier layer of the film when a vinylidene chloride copolymer is used as in the barrier layer.

4. Cryovac '367 claims 1-2, 7-8, 11, 16-17, 35-36, 42-43, 46-54, 56, 61-63 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189), (2) Dow CGCT XUR-1567-48652-xx resins

Both Mueller (FF 37-42) and Dow CGCT XUR-1567-48652-xx resins (FF 54-62) have been discussed above.

Analogous to § V.E.1 above, it would have been obvious to one of ordinary skill in the art to modify the heat shrink film of Mueller by substituting Dow CGCT XUR-1567-48652-xx resins for the conventional LLDPEs used by Mueller. Insofar as the MWD of CGCT XUR-1567-48652-xx resins is independent of their MI, CGCT XUR-1567-48652-xx resins can be tailored to improve processability without sacrificing toughness through routine optimization of result effective variables, e.g., amount of comonomer used, to provide MWD and CD tailored for film extrusion (FF 56 and 58; Exs 3017-3019 (all)). Furthermore, Dow CGCT XUR-1567-48652-xx resins have densities similar to that of LLDPEs, e.g., 0.915 g/cm³, are said to melt at 109°C and have a Vicat softening point of 102°C and, therefore, would orient at a temperature of hot water, e.g., 83°C to 115°C. In other words, use of CGCT XUR-1567-48652-xx

resins, e.g., -A5, would provide lower heat seal initiation temperatures, faster sealing speeds, improved film optics, lower hexane extractables, better orientation, shrinkage at lower temperatures, etc., and provide processability similar to LDPE, e.g., be useful in a cascading water extrusion film making process.

- 5. Cryovac '367 claims 3-6, 23-24, 37, 39 and 41 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189), (2) Dow CGCT XUR-1567-48652-xx resins and (3) Warren I (US 4,837,084)**

Mueller (FF 37-42), Dow CGCT XUR-1567-48652-xx resins (FF 54-62) and Warren I (FF 85-86) have been discussed above.

Analogous to § V.C.2 above, it would have been obvious to one of ordinary skill in the art to modify the multilayer heat shrink film of Mueller/Dow CGCT XUR-1567-48652-xx by blending the Dow CGCT XUR-1567-48652-xx resins with another conventional natural or synthetic polymer, e.g., a heterogeneous ethylene/higher alpha olefin copolymer or a copolymer of ethylene and vinyl acetate or alkyl acrylate. Use of a blended Dow CGCT XUR-1567-48652-xx resin would improve heat shrink and cold seal properties in the multilayer heat shrink film of Mueller/Dow CGCT XUR-1567-48652-xx.

- 6. Cryovac '367 claims 12-15, 18-34, 38, 40 and 55 are unpatentable under 35 U.S.C. § 103(a) over (1) Mueller (US 4,532,189), (2) Dow CGCT XUR-1567-48652-xx resins, (3) Warren I (US 4,837,084), (4) Ferguson (US 4,640,856), (5) Newsome (US 4,457,960) and (6) Warren II (US 4,957,790)**

Mueller (FF 37-42), Dow CGCT XUR-1567-48652-xx resins (FF 54-62), Warren I (FF 85-86, 95), Ferguson (FF 50-51, 94), Newsome (FF 52-53, 91) and Warren II (FF 92-93, 95) have been discussed above.

Analogous to § V.C.3 above, it would have been obvious to one of ordinary skill in the art to modify the multilayer film of Mueller/Dow CGCT XUR-1567-48652-xx and/or Warren I by providing conventional additional layers, e.g., barrier layers comprising conventional materials, e.g., a vinylidene chloride copolymer or an ethylene vinyl alcohol copolymer or nylon and adhesive layers comprising conventional materials, e.g., an ethylene vinyl alcohol copolymer. Use of a barrier layer would prevent atmospheric oxygen from reacting with packaged food and thereby spoiling the food and/or changing its color. Use of an adhesive layer would prevent delamination of the film's multilayered structure.

It would have been further obvious to one of ordinary skill in the art to extrusion coat a vinylidene chloride copolymer barrier layer between steps B and C of Cryovac '367 process claim 43. This would permit the first or substrate layer to be irradiated without degrading the barrier layer of the film when a vinylidene chloride copolymer is used as in the barrier layer.

V. Miscellaneous

U.S. Patents 6,146,726 and 6,342,282 (Exhibits 3020 and 3021, respectively) are brought to the parties' attention.

96. Claim 14 of U.S. Patent 6,146,726 reads:

A heat-shrinkable multi-layer film consisting essentially of a laminated structure composed of outermost layer A of thermoplastic polyester resin/adhesive layer/intermediate layer D1 of polyamide resin/core layer B of a sealing resin, wherein the sealing resin layer of the innermost layer (C) is a layer formed of a resin material (b) comprising a linear ethylene-1-octene copolymer (a) obtained by using a constrained geometry catalyst and having a 1-octene content not lower than 1 wt.% but lower than 20 wt.% and a density higher than 0.885g/cm³ but not

higher than 0.960 g/cm³.

97. Claim 1 of U.S. Patent 5,342,282 reads:

A heat-shrinkable multi-layer film consisting essentially of four layers (A/D1/B/C), wherein a thermoplastic resin layer is the outermost layer (A), a gas barrier resin layer is a core layer (B), a sealing resin layer is the innermost layer (C), and an intermediate layer (D1) is provided between the outermost layer (A) and the core layer (B), and optionally including an adhesive layer between the individual layers, and further wherein

(1) the sealing resin layer of the innermost layer (C) is a layer formed of a resin material (b) comprising a linear ethylene-1-octene copolymer (a) obtained using a constrained geometry catalyst and having a 1-octene content not lower than 1 wt.% but lower than 20 wt.% and a density higher than 0.885 g/cm³ but not higher than 0.960 g/cm³,

(2) the intermediate layer (D1) is formed of at least one resin (c) selected from the group consisting of polyamide resins, thermoplastic polyester resins and ethylene copolymer resins,

(3) the outermost layer (A) is formed of at least one resin (e) selected from the group consisting of polyolefin resins, thermoplastic polyester resins, polyamide resins and the ethylene-1-octene copolymer (a), and

(4) at least one of the outer most layer (A) and the intermediate layer (D1) comprises a polyamide resin or a thermoplastic polyester resin.


A new STANDING ORDER is attached to this opinion and supercedes any prior STANDING ORDER.

VII. Order

Therefore, in view of the foregoing, it is

ORDERED that both Pechiney and Cryovac present their views, including any argument and any supporting evidence, as to why Cryovac's involved claims are not unpatentable for the reasons given within two (2) months from the issuance of this order; and

mck
FRED E. McKELVEY, Senior
Administrative Patent Judge


RICHARD E. SCHAFER
Administrative Patent Judge

BOARD OF PATENT
APPEALS AND
INTERFERENCES

Carol A. Spiegel
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Administrative Patent Judge

Enc: STANDING ORDER 2004

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**APPENDIX A
EXHIBIT LIST**

| Exhibit No. | Document |
|-------------|---|
| 3001 | Kirk-Othmer ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY, third edition, Vol. 10, pp. 216-245, published by John Wiley & Sons, New York (1980) (Kirk-Othmer 1980) |
| 3002 | <u>Modern Plastics International</u> , January 1985, pp. 42-45 |
| 3003 | Martino, R., "PLASTICSCOPE: New polyolefin resins emerge: 'Branched linear' copolymers," <u>Modern Plastics</u> , pp. 20-22, 25, November 1992 |
| 3004 | "NPE Report: Exxon Cites 'Breakthrough' in Olefins Polymerization," <u>Modern Plastics</u> , pp. 61-62, July 1991 |
| 3005 | Van der Sanden et al. (Van der Sanden), "A New Family of Linear Ethylene Polymers With Enhanced Sealing Performance," <u>Polymers, Laminations & Coatings Conference</u> , (San Diego) Proc. (Book 1): pp. 289-296 (TAPPI; September 3-6, 1991) |
| 3006 | U.S. Patent 6,437,064 (Pechiney '064), issued 20 August 2002 |
| 3007 | U.S. Application 08/996,367 (Cryovac '367), filed 22 December 1997 |
| 3008 | U.S. Application 09/583,654 (Cryovac '654), filed 30 May 2000 |
| 3009 | European Patent Application 416 815 (Dow), published 13 March 1991 |
| 3010 | U.S. Patent 5,272,236 (Lai), issued 21 December 1993 |
| 3011 | U.S. Patent 4,532,189 (Mueller), issued 30 July 1985 |
| 3012 | U.S. Patent 4,640,856 (Ferguson), issued 3 February 1987 |
| 3013 | U.S. Patent 4,457,960 (Newsome), issued 3 July 1984 |
| 3014 | G.D. Schwank, "Selected Applications for Constrained Geometry Catalyst Technology (CGCT) Polymers," Proceedings of the 1992 Specialty Polyolefins Conference, Schotland Business Research, Inc., September 23, 1992 (held in Houston, Texas). |
| 3015 | Kirk-Othmer ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY, fourth edition, Vol. 17, pp. 702-819, published by John Wiley & Sons, New York (1996) (Kirk-Othmer 1996) |

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| 3016 | Paper 78, attachment C002, Dow Chemical Company confidentiality agreement with Cryovac (dates redacted) |
| 3017 | Paper 78, attachment C003, said to be a two-page Dow Chemical Company correspondence from Michael J. Levinson, Project Manager, New Technology, Dow Plastics, to Johnnie J. Walters, W.R. Grace, Cryovac Division (dates redacted) |
| 3018 | Paper 78, attachment C004, said to be a two page Dow Chemical Company correspondence from Kaelyn C. Koch and Rex A. Maugens, Polyolefins TS&D, to Steve Garland, W.R. Grace, Cryovac Division (dates redacted) |
| 3019 | Paper 78, attachment C006, said to be a three-page Dow Chemical Company correspondence from Rex A. Maugans, Polyolefins TS&D, to Steve Garland, W.R. Grace, Cryovac Division (dates redacted) |
| 3020 | U.S. Patent 6,146,726 (Yoshii I), issued 14 November 2000 |
| 3021 | U.S. Patent 6,342,282 (Yoshii II), issued 29 January 2002 |
| 3022 | U.S. Patent 4,837,084 (Warren I), issued 6 June 1989 |
| 3023 | U.S. Patent 4,957,790 (Warren II), issued 18 September 1990 |

APPENDIX B
CRYOVAC '654 CLAIM CHART

1. A film suitable for packaging {Ex 3011: c. 1, ll. 8-9; Ex 3010: c. 14, ll. 10-11; Ex 3009: p. 11, l. 37} comprising a homogeneous single site catalyzed copolymer of ethylene and an alpha-olefin having from three to ten carbon atoms, said single site catalyzed copolymer having long chain branching {Ex 3011: c. 2, ll. 39-41 and c. 3, ll. 57-63; Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 2, ¶ 1; Ex 3019, p. 3} wherein said film is a multilayer film and is heat shrinkable {Ex 3011: c. 1, ll. 8-13; c. 2, ll. 3-11 and c. 4, ll. 18-26}.
3. The heat shrinkable film as set forth in claim 1, wherein said alpha-olefin has from four to eight carbon atoms {Ex 3011: c. 3, ll. 57-63; Ex 3010: c. 3, ll. 40-42; Ex 3009: p. 6, ll. 21-23; Exs 3017-3019}.
4. The film as set forth in claim 1, wherein said single site catalyzed copolymer is blended with another thermoplastic homopolymer or copolymer {Ex 3011: c. 4, ll. 35-36 and 45-47; c. 5, ll. 2-23 and 46; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6}.
5. The film as set forth in claim 1, wherein said single site catalyzed copolymer has a density from about 0.86 g/cc to about 0.95 g/cc {Ex 3011: c. 1, ll. 9-12 and c. 3, ll. 57-62; Ex 3010: c. 3, ll. 6-7; Ex 3009: p. 12, l. 39; Ex 3017: p. 1; Ex 3018: p. 1; Ex 3019: p. 12, l. 39}.
7. The film according to Claim 1, wherein the homogeneous single site catalyzed copolymer has a density of from about 0.895 to 0.915 g/cc {Ex 3011: c. 1, ll. 9-12 and c. 3, ll. 57-62; Ex 3010: c. 3, ll. 6-7; Ex 3009: p. 12, l. 39; Ex 3017: p. 1; Ex 3018: p. 1; Ex 3019: p. 12, l. 39}.
10. The film according to Claim 1, wherein the homogeneous single site catalyzed copolymer is metallocene catalyzed copolymer {Ex 3010: c. 6, l. 29 - c. 13, l. 50; Ex 3009: abstract and p. 2, ll. 10-16; Ex 3017; Ex 3018; Ex 3019}.
11. The multilayer film according to Claim 1, wherein the multilayer film comprises a barrier layer {Ex 3011: c. 4, ll. 37-40; Ex 3012: c. 4, l. 48-57; Ex 3013: c. 1, ll. 36-40} containing at least one member selected from the group consisting of: (a) a copolymer of vinylidene chloride and vinyl chloride, (b) a copolymer of vinylidene chloride and methyl acrylate, (c) a copolymer of ethylene and ethyl acrylate, (d) a copolymer of vinylidene chloride and acrylonitrile, and (e) a copolymer of ethylene and vinyl alcohol {Ex 3012: c. 1, ll. 43-44 and c. 4, ll. 51-55; Ex 3013: c. 1, ll. 35-39 and c. 3, ll. 25-28}.

12. The multilayer film according to Claim 1, wherein at least one layer of the film is irradiated {Ex 3011: c. 2, ll. 22-26 and c. 7, ll. 55-65}.

13. The multilayer film according to Claim 12, wherein the film is irradiated to a level of up to about 12 MR {Ex 3011: c. 7, ll. 65-67}.

14. The multilayer film according to Claim 13, wherein the film is irradiated to a level of from about 2 to 9 MR {Ex 3011: c. 7, ll. 65-67}.

20. The multilayer film according to Claim 1, wherein the film has been oriented at a softening temperature of the single site catalyzed copolymer having long chain branching {Ex 3011: c. 1, ll. 28-33}.

21. The multilayer film according to Claim 20, wherein the film has been oriented at a temperature of from 70°C to 100°C {Ex 3009: p. 12, ll. 40-41; Ex 3018: p. 1}.

22. The multilayer film according to Claim 20, wherein the film has been oriented at a temperature of from 80°C to 100°C {Ex 3009: p. 12, ll. 40-41; Ex 3018: p. 1}.

23. The multilayer film according to Claim 1, wherein the film exhibits an L+T free shrink of at least 67 percent {Ex 3011: c. 11, ll. 1-20}.

24. A tubing {Ex 3011: c. 1, ll. 16-17 and 22-26; c. 4, ll. 18-26 and c. 7, ll. 44-47} comprising a heat-shrinkable multilayer film suitable for packaging, wherein the film comprises a homogeneous single site catalyzed copolymer of ethylene and an alpha-olefin having from three to then [sic, ten] carbon atoms, the single site catalyzed copolymer having long chain branching {Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, l. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 11, ll. 32-41 and p. 12, ll. 34-41; Exs 3017-3019}.

25. A process for making a heat-shrinkable film {Ex 3011: c. 1, ll. 22-23; c. 4, ll. 18-26 and c. 7, ll. 21-24; Ex 3010: c. 2, ll. 8-18}, comprising:

(A) extruding a film {Ex 3011: c. 1, ll. 22-26; c. 7, ll. 35-37 and c. 8, ll. 50-53 and 60-61} comprising a homogeneous single site catalyzed copolymer of ethylene and an alpha-olefin having from three to then [sic, ten] carbon atoms, the single site catalyzed copolymer having long chain branching {Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, l. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 11, ll. 32-41 and p. 12, ll. 34-41; Exs 3017-3019}; and
B) cooling the film to the solid state with water {Ex 3011: c. 1, l. 26; c. 8, l. 16 and c. 8, l. 67 - c. 9, l. 4};

C) reheating the film to a softening temperature of the homogeneous single site catalyzed copolymer having long chain branching {Ex 3011: c. 1, ll. 27-33; c. 8, ll. 16-17 and c. 9, ll. 4-12};

D) stretching the film so that an oriented molecular configuration is produced **{Ex 3011: c. 1, ll. 56-59; c. 7, l. 16 and c. 9, ll. 13-16}**; and

E) quenching the film while substantially retaining its stretched dimensions to set the film in the oriented molecular configuration **{Ex 3011: c. 1, ll. 66-68 and c. 9, ll. 16-17}**.

26. The process according to Claim 25, wherein the step of orienting by stretching is carried out using a tenter frame **{Ex 3011: c. 1, ll. 59-62}**.

APPENDIX C
CRYOVAC '367 CLAIM CHART

1. A heat shrinkable film {Ex 3011: c. 1, ll. 8-13; c. 2, ll. 3-11; c. 4, ll. 18-26 and c. 7, ll. 12-15; Ex 3010: c. 4, ll. 10-11; Ex 3009: p. 11, l. 37} comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to ten carbon atoms, said copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 2, ll. 39-41 and c. 3, ll. 57-63; Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4; p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}, wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water {Ex 3011: c. 1, ll. 22-26; c. 7, ll. 35-37; c. 8, ll. 16, 50-53 and 60-61 and c. 8, l. 67 - c. 9, l. 4}, and thereafter heated to its softening temperature and stretched in its machine and transverse directions {Ex 3011: c. 1, ll. 27-33 and 56-59; c. 7, l. 16; c. 8, ll. 16-17 and c. 9, ll. 4-16} followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated {Ex 3011: c. 1, ll. 66-68 and c. 9, ll. 16-17}.
2. A heat shrinkable film as set forth in claim 1, wherein said homogeneous linear single site catalyzed copolymer is blended with at least one member selected from the group consisting of a thermoplastic homopolymer and a thermoplastic copolymer {Ex 3011: c. 4, ll. 35-36 and 45-47 and c. 5, ll. 2-23 and 46; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6; Ex 3022: c. 2, ll. 11- 61}.
3. A heat shrinkable film as set forth in claim 2, wherein said thermoplastic copolymer of ethylene and an alpha-olefin has from three to ten carbon atoms {Ex 3011: c. 4, ll. 35-36 and 45-47 and c. 5, ll. 2-23 and 46; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6; Ex 3022: c. 2, ll. 11- 61}.
4. A heat shrinkable film as set forth in claim 3, wherein said thermoplastic copolymer is heterogeneous, and has a density below about 0.90 g/cc {Ex 3011: c. 4, ll. 12-15; 35-36 and 45-47 and c. 5, ll. 2-23 and 46; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6; Ex 3022: c. 2, ll. 11- 61}.
5. A heat shrinkable film as set forth in claim 3, wherein said thermoplastic copolymer is heterogeneous, and has a density above about 0.90 g/cc {Ex 3011: c. 4, ll. 12-15; 35-36 and 45-47 and c. 5, ll. 2-23 and 46; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6; Ex 3022: c. 2, ll. 11- 61}.
6. A heat shrinkable film as set forth in claim 2, wherein said thermoplastic copolymer comprises a copolymer of ethylene and a second comonomer selected from the group consisting of vinyl acetate, alkyl acrylate, carbon monoxide, butadiene,

styrene, acrylic acid and a metal neutralized salt of an acrylic acid {Ex 3010: c. 14, ll. 31-40; Ex 3022: c. 2, ll. 11- 61}.

7. A heat shrinkable film as set forth in claim 2, wherein said thermoplastic homopolymer comprises a homopolymer of an alpha-olefin {Ex 3011: c. 4, ll. 35-36; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6; Ex 3022: c. 2, ll. 11- 61}.

8. A heat shrinkable film as set forth in claim 1, wherein said homogeneous linear copolymer comprises a copolymer of ethylene and an alpha-olefin having from six to eight carbon atoms {Ex 3011: c. 3, ll. 57-63; Ex 3010: c. 3, ll. 40-42; Ex 3009: p. 6, ll. 21-23; Exs 3017-3019 (all)}.

10. A heat shrinkable film as set forth in claim 8, wherein said homogeneous linear copolymer comprises a copolymer of ethylene and hexene {Ex 3011: c. 3, ll. 57-63; Ex 3010: c. 3, ll. 40-42; Ex 3009: p. 6, ll. 21-23}.

11. A heat shrinkable film as set forth in claim 8, wherein said homogeneous linear copolymer comprises a copolymer of ethylene and octene {Ex 3011: c. 3, ll. 57-63; Ex 3010: c. 3, ll. 40-42; Ex 3009: p. 6, ll. 21-23; Exs 3017-3019 (all)}.

12. A heat shrinkable film as set forth in claim 1, wherein said film is a multilayer film and said homogeneous copolymer is present in at least one layer of said multilayer film {Ex 3011: c. 4, ll. 24-40 and 41-46; c. 6, ll. 36-43; Ex 3013: c. 7, l. 56 - c. 8, l. 15}.

13. The heat shrinkable film as set forth in claim 1, wherein said homogeneous copolymer is present in an outer layer {Ex 3011: c. 5, ll. 41-47 and c. 6, ll. 20-23; Ex 3013: c. 7, l. 56 - c. 8, l. 15}.

14. The heat shrinkable film as set forth in claim 13, wherein said outer layer is a heat sealing layer {Ex 3011: c. 5, ll. 41-47 and c. 6, ll. 20-23; Ex 3013: c. 4, ll. 57-64 and c. 7, l. 56 - c. 8, l. 15; Ex 3022: c. 2, ll. 11- 61}.

15. The heat shrinkable film as set forth in claim 1, wherein said homogeneous linear copolymer is present in an inner layer {Ex 3011: c. 4, ll. 24-47; c. 5, l. 66 - c. 6, l. 2 and c. 6, ll. 36-43; Ex 3013: c. 7, l. 56 - c. 8, l. 15}.

16. A heat shrinkable film {Ex 3011: c. 1, ll. 8-13; c. 2, ll. 3-11; c. 4, ll. 18-26 and c. 7, ll. 12-15; Ex 3010: c. 4, ll. 10-11; Ex 3009: p. 11, l. 37} having a symmetrical structure comprising: outer layers comprising a propylene homopolymer or copolymer {Ex 3011: c. 5, l. 66 - c. 6, l. 2}; and a core layer comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to eight carbon atoms, said homogeneous copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 2, ll. 39-41; c. 3, ll. 57-63 and c. 5, l. 66 - c. 6, l. 2; Ex 3010: c. 1, ll. 6-

10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4; p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}; wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water {Ex 3011: c. 1, ll. 22-26; c. 7, ll. 35-37; c. 8, ll. 16, 50-53 and 60-61 and c. 8, l. 67 - c. 9, l. 4}, and thereafter heated to its softening temperature and stretched in its machine and transverse directions {Ex 3011: c. 1, ll. 27-33 and 56-59; c. 7, l. 16; c. 8, ll. 16-17 and c. 9, ll. 4-16} followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated {Ex 3011: c. 1, ll. 66-68 and c. 9, ll. 16-17}.

17. A heat shrinkable film as set forth in claim 16, wherein said propylene copolymer comprises a copolymer of from about 100% to about 90% by weight of polypropylene and from about 0% to about 10% by weight of ethylene {Ex 3011: c. 4, ll. 6-11 and c. 5, l. 66 - c. 6, l. 2}.

18. A heat shrinkable multilayer film {Ex 3011: c. 1, ll. 8-13; c. 2, ll. 3-11; c. 4, ll. 18-26 and c. 7, ll. 12-15 Ex 3010: c. 4, ll. 10-11; Ex 3009: p. 11, l. 37} comprising: a heat sealing layer {Ex 3011: c. 5, ll. 41-47 and c. 6, ll. 20-23; Ex 3012: c. 4, ll. 57-64; Ex 3022: c. 2, ll. 11-61}; an inner layer comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to eight carbon atoms, said copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 2, ll. 39-41 and c. 3, ll. 57-63; Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4; p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}; and a barrier layer {Ex 3011: c. 4, ll. 37-40; Ex 3012: c. 1, ll. 43-44 and c. 4, l. 48-57; Ex 3013: c. 1, ll. 35-40 and c. 3, ll. 25-28}; and wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water {Ex 3011: c. 1, ll. 22-26; c. 7, ll. 35-37; c. 8, ll. 16, 50-53 and 60-61 and c. 8, l. 67 - c. 9, l. 4}, and thereafter heated to its softening temperature and stretched in its machine and transverse directions {Ex 3011: c. 1, ll. 27-33 and 56-59; c. 7, l. 16; c. 8, ll. 16-17 and c. 9, ll. 4-16} followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated {Ex 3011: c. 1, ll. 66-68 and c. 9, ll. 16-17}.

19. A heat shrinkable multilayer film as set forth in claim 18, wherein said barrier layer comprises a copolymer of vinylidene chloride and methyl acrylate {Ex 3023: c. 8, ll. 1-7}.

20. A heat shrinkable multilayer film as set forth in claim 18, wherein said barrier layer comprises a copolymer of vinylidene chloride and vinyl chloride {Ex 3012: c. 1, ll. 43-44 and c. 4, ll. 51-55; Ex 3013: c. 1, ll. 35-39 and c. 3, ll. 25-28; Ex 3023: c. 8, ll. 1-7}.

21. A heat shrinkable multilayer film as set forth in claim 18, wherein said barrier layer comprises an ethylene vinyl alcohol copolymer {Ex 3013: c. 1, II. 35-39 and 56-58 and c. 3, II. 25-28; Ex 3023: c. 7, II. 24-39}.

22. A heat shrinkable multilayer film as set forth in claim 18, wherein said barrier layer comprises a nylon {Ex 3013: c. 8, II. 51-56}.

23. A heat shrinkable multilayer film as set forth in claim 18, wherein said heat sealing layer comprises a copolymer of ethylene and a comonomer selected from the group consisting of vinyl acetate, alkyl acrylate, acrylic acid, and a metal neutralized salt of an acrylic acid {Ex 3022: c. 2, II. 11-61}.

24. A heat shrinkable multilayer film as set forth in claim 18, wherein said heat sealing layer comprises a heterogeneous copolymer of ethylene and an alpha-olefin having from three to ten carbon atoms {Ex 3022: c. 2, II. 11-61}.

26. A heat shrinkable multilayer film as set forth in claim 18, further comprising an additional layer which is an outer layer {Ex 3011: c. 4, II. 41-47; Ex 3013: c. 7, I. 56 - c. 8, I. 15}.

27. A heat shrinkable multilayer film as set forth in claim 18 further including at least one inner adhesive layer {Ex 3013: c. 7, II. 59-64 and c. 7, I. 56 - c. 8, I. 15}.

28. A heat shrinkable multilayer film {Ex 3011: c. 1, II. 8-13; c. 2, II. 3-11; c. 4, II. 18-26 and c. 7, II. 12-15; Ex 3010: c. 4, II. 10-11; Ex 3009: p. 11, I. 37} comprising: a heat sealing layer comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to eight carbon atoms, said copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 2, II. 39-41 and c. 3, II. 57-63; Ex 3010: c. 1, II. 6-10; c. 2, II. 22-50; c. 3, II. 4-35 and 48-63; c. 5, II. 1-7, 40-43 and 59-64; c. 18, II. 17-24 and 43-45 and c. 19, II. 20-23; Ex 3009: p. 2, II. 40-42; p. 5, II. 46-51; p. 6, II. 21-23; p. 8, I. 46 - p. 9, I. 4; p. 11, II. 32-41 and p. 12, II. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}; and a barrier layer {Ex 3011: c. 4, II. 37-40; Ex 3012: c. 1, II. 43-44 and c. 4, I. 48-57; Ex 3013: c. 1, II. 35-40 and c. 3, II. 25-28}; and wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water {Ex 3011: c. 1, II. 22-26; c. 7, II. 35-37; c. 8, II. 16, 50-53 and 60-61 and c. 8, I. 67 - c. 9, I. 4}, and thereafter heated to its softening temperature and stretched in its machine and transverse directions {Ex 3011: c. 1, II. 27-33 and 56-59; c. 7, I. 16; c. 8, II. 16-17 and c. 9, II. 4-16} followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated {Ex 3011: c. 1, II. 66-68 and c. 9, II. 16-17}.

29. A heat shrinkable multilayer film as set forth in claim 28, wherein said barrier layer comprises a copolymer of vinylidene chloride and methyl acrylate {Ex 3023: c. 8,

II. 1-7}.

30. A heat shrinkable multilayer film as set forth in claim 28, wherein said barrier layer comprises a copolymer of vinylidene chloride and vinyl chloride {Ex 3012: c. 1, II. 43-44 and c. 4, II. 51-55; Ex 3013: c. 1, II. 35-39 and c. 3, II. 25-28; Ex 3023: c. 8, II. 1-7}.

31. A heat shrinkable multilayer film as set forth in claim 28, wherein said barrier layer comprises an ethylene vinyl alcohol copolymer {Ex 3013: c. 1, II. 35-39 and 56-58 and c. 3, II. 25-28; Ex 3023: c. 7, II. 24-39}.

32. A heat shrinkable multilayer film as set forth in claim 28, wherein said barrier layer comprises a nylon {Ex 3012: c. 8, II. 51-56}.

33. A heat shrinkable multilayer film as set forth in claim 28, further comprising an additional layer which is an outer layer {Ex 3013: c. 7, II. 59-64 and c. 7, I. 56 - c. 8, I. 15}.

34. A heat shrinkable multilayer film as set forth in claim 28, further including at least one inner adhesive layer {Ex 3013: c. 7, II. 59-64 and c. 7, I. 56 - c. 8, I. 15}.

35. A heat shrinkable film {Ex 3011: c. 1, II. 8-13; c. 2, II. 3-11; c. 4, II. 18-26 and c. 7, II. 12-15; Ex 3010: c. 4, II. 10-11; Ex 3009: p. 11, I. 37} comprising at least two layers {Ex 3011: c. 4, II. 41-46 and c. 6, II. 36-43} wherein at least one of said layers comprises one of said layers comprises a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to eight carbon atoms, said copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 2, II. 39-41 and c. 3, II. 57-63; Ex 3010: c. 1, II. 6-10; c. 2, II. 22-50; c. 3, II. 4-35 and 48-63; c. 5, II. 1-7, 40-43 and 59-64; c. 18, II. 17-24 and 43-45 and c. 19, II. 20-23; Ex 3009: p. 2, II. 40-42; p. 5, II. 46-51; p. 6, II. 21-23; p. 8, I. 46 - p. 9, I. 4; p. 11, II. 32-41 and p. 12, II. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}, and wherein at least one of said layers is crosslinked {Ex 3011: c. 2, II. 22-26 and c. 7, II. 55-56}, and wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water {Ex 3011: c. 1, II. 22-26; c. 7, II. 35-37; c. 8, II. 16, 50-53 and 60-61 and c. 8, I. 67 - c. 9, I. 4}, and thereafter heated to its softening temperature and stretched in its machine and transverse directions {Ex 3011: c. 1, II. 27-33 and 56-59; c. 7, I. 16; c. 8, II. 16-17 and c. 9, II. 4-16} followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated {Ex 3011: c. 1, II. 66-68 and c. 9, II. 16-17}.

36. A heat shrinkable multilayer film {Ex 3011: c. 1, II. 8-13; c. 2, II. 3-11; c. 4, II. 18-26 and c. 7, II. 12-15; Ex 3010: c. 4, II. 10-11; Ex 3009: p. 11, I. 37} having a symmetrical structure comprising {Ex 3013: c. 7, I. 56 - c. 8, I. 15}: outer layers

comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to eight carbon atoms, said copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 2, ll. 39-41 and c. 3, ll. 57-63; Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4; p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}; and an inner core layer {Ex 3011: c. 2, ll. 39-41; c. 3, ll. 57-63 and c. 5, l. 66 - c. 6, l. 2; Ex 3013: c. 7, l. 56 - c. 8, l. 15; Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}; and wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water {Ex 3011: c. 1, ll. 22-26; c. 7, ll. 35-37; c. 8, ll. 16, 50-53 and 60-61 and c. 8, l. 67 - c. 9, l. 4}, and thereafter heated to its softening temperature and stretched in its machine and transverse directions {Ex 3011: c. 1, ll. 27-33 and 56-59; c. 7, l. 16; c. 8, ll. 16-17 and c. 9, ll. 4-16} followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated {Ex 3011: c. 1, ll. 66-68 and c. 9, ll. 16-17}.

37. A heat shrinkable multilayer film as set forth in claim 36, wherein said inner core layer comprises a copolymer of ethylene and at least one comonomer selected from the group consisting of vinyl acetate, alkyl acrylate, acrylic acid, and a metal neutralized salt of an acrylic acid {Ex 3022: c. 2, ll. 11- 61}.

38. A heat shrinkable multilayer film as set forth in claim 36, further including two identical layers immediately adjacent opposed surfaces of said inner core layer {Ex 3011: c. 4, ll. 41-46 and c. 6, ll. 36-43; Ex 3013: c. 7, l. 56 - c. 8, l. 15}.

39. A heat shrinkable multilayer film as set forth in claim 38, wherein said inner layers comprise a heterogeneous copolymer of ethylene and an alpha-olefin having from three to ten carbon atoms {Ex 3011: c. 4, ll. 35-36 and 45-47 and c. 5, ll. 2-23 and 46; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6; Ex 3022: c. 2, ll. 11- 61}.

40. A heat shrinkable multilayer film as set forth in claim 38, wherein said inner layers comprise a homogeneous single site catalyzed copolymer of ethylene and an alpha-olefin having from three to eight carbon atoms {Ex 3011: c. 3, ll. 57-63; Ex 3010: c. 3, ll. 40-42; Ex 3009: p. 6, ll. 21-23}.

41. A heat shrinkable multilayer film as set forth in claim 36, wherein said outer layers further include at least one heterogeneous copolymer of ethylene and an alpha-olefin having from three to ten carbon atoms {Ex 3011: c. 4, ll. 35-36 and 45-47 and c. 5, ll. 2-23 and 46; Ex 3010: c. 14, ll. 31-40; Ex 3009: p. 13, ll. 1-6; Ex 3022: c. 2, ll. 11- 61}.

42. A seamless tubing {Ex 3011: c. 1, ll. 16-17 and 22-26; c. 4, ll. 18-26 and c. 7, ll. 12-15 and 44-47} comprising a multilayer, heat shrinkable film {Ex 3011: c. 1, ll. 8-13; c. 2, ll. 3-11 and c. 4, ll. 18-26; Ex 3010: c. 4, ll. 10-11; Ex 3009: p. 11, l. 37} comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to ten carbon atoms, said copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 2, ll. 39-41 and c. 3, ll. 57-63; Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4; p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}, wherein said heat shrinkable film has been extruded and cooled to its solid state by cascading water {Ex 3011: c. 1, ll. 22-26; c. 7, ll. 35-37; c. 8, ll. 16, 50-53 and 60-61 and c. 8, l. 67 - c. 9, l. 4}, and thereafter heated to its softening temperature and stretched in its machine and transverse directions {Ex 3011: c. 1, ll. 27-33 and 56-59; c. 7, l. 16; c. 8, ll. 16-17 and c. 9, ll. 4-16} followed by being quenched, so that said heat shrinkable film will return to its unstretched dimensions when heated {Ex 3011: c. 1, ll. 66-68 and c. 9, ll. 16-17}.

43. A process for making a heat-shrinkable film {Ex 3011: c. 1, ll. 8-13; c. 2, ll. 3-11; c. 4, ll. 18-26 and c. 7, ll. 12-15; Ex 3010: c. 4, ll. 10-11; Ex 3009: p. 11, l. 37}, comprising: (A) extruding a film comprising a homogeneous linear single site catalyzed copolymer of ethylene and an alpha-olefin having from six to ten carbon atoms, said copolymer having a density of at least 0.902 g/cc {Ex 3011: c. 1, ll. 22-26; c. 2, ll. 39-41 and c. 3, ll. 57-63; c. 7, ll. 35-37 and c. 8, ll. 50-53 and 60-61; Ex 3010: c. 1, ll. 6-10; c. 2, ll. 22-50; c. 3, ll. 4-35 and 48-63; c. 5, ll. 1-7, 40-43 and 59-64; c. 18, ll. 17-24 and 43-45 and c. 19, ll. 20-23; Ex 3009: p. 2, ll. 40-42; p. 5, ll. 46-51; p. 6, ll. 21-23; p. 8, l. 46 - p. 9, l. 4; p. 11, ll. 32-41 and p. 12, ll. 34-41; Ex 3017: pp. 1-2; Ex 3018: p. 1; Ex 3019: p. 3}; and
B) cooling the film to the solid state by cascading water {Ex 3011: c. 1, l. 26; c. 8, l. 16 and c. 8, l. 67 - c. 9, l. 4};
C) reheating the film to a softening temperature of the homogeneous linear single site catalyzed copolymer {Ex 3011: c. 1, ll. 27-33; c. 8, ll. 16-17 and c. 9, ll. 4-12};
D) stretching the film so that an oriented molecular configuration is produced {Ex 3011: c. 1, ll. 56-59; c. 7, l. 16 and c. 9, ll. 13-16};
E) quenching the film while substantially retaining its stretched dimensions to set the film in the oriented molecular configuration {Ex 3011: c. 1, ll. 66-68 and c. 9, ll. 16-17}.

46. The process according to Claim 43, wherein the film is reheated to its orientation temperature by hot water {Ex 3011: c. 1, ll. 28-33; Ex 3009: p. 12, ll. 40-41; Ex 3018, p. 1}.

47. The process according to Claim 43, wherein the step of orienting by stretching is carried out using a trapped bubble {Ex 3011: c. 1, ll. 56-62 and c. 8, ll. 16-29}.

48. The process according to Claim 43, wherein the step of orienting by stretching is carried out using a tenter frame **{Ex 3011: c. 1, ll. 56-62}**.

49. The process according to Claim 43, wherein the film is oriented in both its machine direction and its transverse direction **{Ex 3011: c. 1, ll. 56-66 and c. 8, ll. 16-35}**.

50. The process according to Claim 43, wherein the film is oriented at a temperature of from 83°C to 115°C **{Ex 3011: c. 1, ll. 28-33; Ex 3009: p. 12, ll. 40-41; Ex 3018: p. 1}**.

51. The process according to Claim 43, wherein the film is oriented at a temperature of from 87°C to 99°C **{Ex 3011: c. 1, ll. 28-33; Ex 3009: p. 12, ll. 40-41; Ex 3018, p. 1}**.

52. The process according to Claim 43, wherein the film is oriented at a temperature of from 91°C to 99°C **{Ex 3011: c. 1, ll. 28-33; Ex 3009: p. 12, ll. 40-41; Ex 3018, p. 1}**.

53. The process according to Claim 43, further comprising irradiating the film after cooling the film to the solid state **{Ex 3011: c. 2, ll. 22-26 and c. 7, ll. 55-65}**.

54. The process according to Claim 53, comprising irradiating the film after step E **{Ex 3011: c. 8, ll. 3-5}**.

55. The process according to Claim 43, further comprising, between steps B and C, extrusion coating the film with a layer comprising at least one member selected from the group consisting of vinylidene chloride/vinyl chloride copolymer, vinylidene chloride/methyl acrylate copolymer, vinylidene chloride/ethyl acrylate copolymer, and vinylidene chloride/acrylonitrile copolymer **{Ex 3012: c. 6, ll. 29-37; Ex 3022: c. 6, ll. 58-62; Ex 3023: c. 7, ll. 58-62}**.

56. The heat shrinkable film according to Claim 2, wherein said film is a multilayer film **{Ex 3011: c. 4, ll. 24-40 and 41-46 and c. 6, ll. 36-43}**.

61. The heat shrinkable film according to Claim 1, wherein the multilayer film has at least 3 layers **{Ex 3011: c. 4, ll. 24-40 and 41-46 and c. 6, ll. 36-43}**.

62. The heat shrinkable film according to Claim 61, wherein the homogeneous linear single site catalyzed copolymer is present in an inner layer **{Ex 3011: c. 4, ll. 24-40 and 41-46 and c. 6, ll. 36-43}**.

63. The heat shrinkable film according to Claim 61, wherein the homogeneous linear

single site catalyzed copolymer is present in an outer layer {Ex 3011: c. 5, ll. 41-47 and c. 6, ll. 20-23}.